

# THE MIXED TUMORS OF THE SALIVARY GLANDS.

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*(A Study from the Department of Pathology of Columbia University.)*

It has long been known that the tumors of the salivary glands possess, as a rule, a very peculiar morphology which does not correspond to the structure of the tumors found in other organs. The greater number of the salivary tumors belong to a class known as mixed or, what is perhaps better, complex tumors; that is, new growths containing a considerable variety of tissues generally regarded as of mesoblastic origin, such as cartilage, myxomatous tissue, fat, and lymphoid structures. The parenchyma cells, proper, resemble morphologically either connective-tissue cells, in which case the tumors are considered as sarcomata, or endothelial cells, in which case the growths have long been called endotheliomata.

Beside these definitely mesoblastic structures these complex growths contain cells which resemble epithelial, endothelial, or connective-tissue cells, and accordingly the tumors have been considered as of epithelial, endothelial, or of a sarcomatous nature. These cells, which for convenience may be designated as parenchymal to distinguish them from the cells of the stroma, are present in greater or less abundance in the new growths, and give them their peculiar morphology. The variations which exist in the proportions between the stroma and the parenchyma and in the morphology of the cells of the stroma and parenchyma have given rise to much confusion in the classification of these tumors, and have rendered difficult the exact determination of their histogenetic relationships.

Pathologists have endeavored to escape responsibility by

coining compound titles to include all the forms of tissues found in such a complex growth; thus, adeno-myxo-chondro-sarcoma has frequently been used to designate tumors of this group. This additive method of naming tumors is quite unscientific, and gives no just idea of the pathological relations of the growth nor of its clinical character. Hansemann has carried it to an extreme. He proposes the following division of the mixed tumors which are at present generally considered to be of endothelial origin:

1. Endothelial Carcinoma.
2. Endothelial Sarcoma.
3. Endothelial Carcinosarcoma.
4. Endothelial tumors with development of special parts of the stroma. (*a*) Cylindroma; (*b*) Myxoma; (*c*) Chondroma; (*d*) Scirrhus; (*e*) Mixed forms with transition into sarcoma or carcinoma.
5. Endothelial Adenoma.

The question immediately arises in connection with the use of such a scheme of classification as to the distinctive morphology of an endothelial tumor and of endothelium. The originator of the term endothelium was His, in 1865; and by it he denoted the cellular linings of the serous cavities, of the blood-vessels, synovial membranes, lymph spaces, etc. Golgi then applied the term to certain tumors derived from the meninges and called them endotheliomata. Much opposition has arisen of late among embryologists to the use of the word endothelium as designating a particular group of lining cells, and the general trend of opinion is to replace it by epithelium. Thus, Stöhr calls the cells lining the blood-vessels, epithelium; and Hertwig has shown that the probable derivation of the flat cells lining the coelom cavity is from the hypoblastic layer of the embryo, and that therefore these cells should be called epithelial. This view is shared by Klaatsch in a paper on the classification of tumors on an embryological basis. The French school also are inclined to call all flat covering cells epithelium, and for consistency, therefore, tumors arising from these cells, carcinomata or adenomata. Minot and Kollman, on the other hand,

consider the lining cells of the coelom cavity and of the blood-vessels and lymph spaces as mesoblastic in origin, and therefore endothelium. Marchand would limit the term endothelium to the vascular linings and call all other lining cells, surface cells (Deckzellen). The name epithelium he considers should be restricted to all cells, without regard to their origin, which line hollow spaces and free surfaces, these cells lying closely together without well-developed interstitial substance. He suggests as a suitable word for all the surface layers of cells (Deckschichten) the Greek derivative, epithem.

In the mixed tumors of the salivary glands the parenchymal cells are arranged in long anastomosing strands which often form alveoli lined with one or more layers of flat cells. The difficulty which has arisen in the classification of these tumors lies chiefly in the determination of the histogenetic relationships of these cells. For many years they have been assumed to be derived from cells lining the connective-tissue spaces, and solely from morphological considerations have been regarded as endothelial cells and of mesoblastic origin. Now, inasmuch as the embryological status of the cells lining the lymph spaces has never been determined, a double assumption is made in ascribing to the cells of the mixed tumors an endothelial origin, for not only must the adherent of the endothelial theory show that the tumor cells are derived from the cells lining the tissue spaces, but he must also show that these cells are of mesoblastic origin, and therefore not epithelium. The chief exponent of the endothelial theory has been Rudolf Volkmann, who in 1895 published an important monograph on the endothelial tumors. Since that time the interest in this peculiar group of tumors has greatly increased, and numerous papers have appeared describing mixed tumors from various portions of the body, the writers accepting, as a rule, the general classification laid down by Volkmann and the morphological criteria which he assumed for the differentiation of the epithelial and endothelial growths. The following extract from Volkmann's monograph defines his position on the subject: "The characteristic morphological peculiarities of the endothe-

lial tumors lie in the arrangement of the tumor cells in strands and tubules, which distinguishes the growths from the sarcomata and gives them a close resemblance to the carcinomata. The cells of the tumors are often in very close relationship with the connective tissue of the spaces in which the cells lie, as evidenced by the fact that the cells remain attached to the walls of the space and do not retract when the tumor is hardened in fixing fluids, as is usual in the carcinomata. The cells of the endothelial tumors line the walls of the tissue spaces without the intervention of a layer of normal endothelial cells, such as is seen in the carcinomata where metastases extend along the lymph spaces. The cartilage of the endothelial tumor arises from the fibrous connective-tissue stroma by a softening of the intercellular substance, and the production first of a myxomatous tissue which later develops cartilage and a homogeneous intercellular tissue. Cell masses of an endothelial nature may also develop from the cartilaginous or myxomatous areas; and in many cases the spindle cells of the connective-tissue stroma must be regarded as genetically equivalent to the endothelial cells of the solid strands and tubules." According to Volkmann, the cells of the peripheral lymph spaces assume an active part in the growth of the tumor and, by their proliferation, form fresh extensions of the new growth. This has been shown to be doubtful both by Ribbert and Borst, who state that the cells of the tumor either grow into a tissue space and line the walls with flat cells or may grow over the pre-existing endothelial cells and produce the appearance of a proliferation of the endothelial cells, a condition also seen in the peripheral growth of the carcinomata. Glandular structures and growths of a carcinomatous nature are never found in the mixed tumors; all such appearances are due to modifications in morphology of the endothelial cells of such growths.

Pathologists of the French school have, however, never accepted the current view of the essentially mesoblastic origin of the cells of the tumors of the salivary glands, and have regarded the cells as derived from the epithelium of the glands, or, in the case of the pharyngeal and buccal tumors, as derived

from the small glands of the buccal mucosa. The majority of the French observers are satisfied to consider the mixed tumors as adenomata or carcinomata, and have described many of the simpler forms of the mixed tumors under this designation, reserving the name of mixed tumor for the more complicated growths containing bone or cartilage. This theory of the carcinomatous nature of these growths fails in several particulars. From a morphological point of view, if the tumors are carcinomata of the salivary glands it should be possible to trace some connection between the glandular structures and the tumor, as is sometimes possible in early growths of other glands of the body; but experience has shown that the tumors of this group are in a very large majority of cases encapsulated, and show no connection with the gland; indeed, they are often at some distance from it. From a clinical point of view, it is difficult to explain why the carcinomata of the salivary glands should differ so much in their clinical features from the carcinomata of other glands; for it is well known that these tumors may be present for twenty or thirty years without giving rise to cachexia or involving the surrounding structures. The theory of direct epithelial derivation also does not explain the presence of embryonic structures nor of cartilage; the latter tissue being present in a large proportion of these tumors. Finally, true carcinomata of the salivary glands have been observed with a morphology corresponding to those arising in the other epithelial glands and with a clinical course which is considered as characteristic of carcinoma; that is, a rapid and progressive involvement of the surrounding structures and an early invasion of the regional lymph nodes.

Pitance, in his thesis published in 1897, suggests that the direct derivation of the parenchymal cells of the mixed tumors from the highly differentiated glandular epithelium is improbable, even from a morphological stand-point, and that it is much more likely that the epithelium forming the cells of the tumor is derived from masses of cells left in or about the glands during the process of development. This mode of derivation might then explain the clinical peculiarities and the presence of

cartilage and embryonal tissues; the rudiments of which might have been left at the same time that the deposition of the glandular epithelium took place. The fact that the epithelial cells have not been in a position to develop functionally might also account for their alteration into an indifferent type not resembling very closely the normal cells of the fully functioning salivary gland. This view, merely suggested as an hypothesis, has not been generally adopted by pathologists.

An important paper on the salivary tumors by Hinsberg appeared in 1899, in which this author developed much the same idea as that of Pitance, but in greater detail and as the result of a large amount of embryological research on the anatomical conditions underlying the development of the salivary glands. He points out that in all of the nine tumors which he examined definite epithelial structures could be demonstrated. In itself this was not a new observation, as Nasse, Volkmann, Maclaure, Cavazzani, and others had figured and described pearl formation in tumors, which they, however, regarded as endothelial in nature. Cavazzani even figures spine cells, which, however, he considers as of endothelial origin. The importance of Hinsberg's work lay in the evidence which he adduced to show the very intimate relations of the parotid and the submaxillary glands to the mesoblastic structures of the first and second branchial arches.

Wilms, in a recent paper, entirely agrees with Hinsberg in considering the parenchyma of the mixed tumors as of epithelial origin, but differs from him in the embryological interpretation of some of the morphological findings in the tumors.

Landsteiner has recently published an article in which he analyzes the results of the examination of twenty-seven tumors, chiefly from the salivary glands, among them an adenoma of the parotid. Of twenty-six mixed tumors examined, he found squamous epithelium and prickly cells in ten. The epithelial remnants were found in five tumors of the parotid; in one of the submaxillary, in two of the lip, one each of the palate and the neck. All but one of the tumors containing epithelium also contained cartilage.

Ribbert, in his text-book on general pathology, and Lubarsch, in his numerous critical reviews of the subject of tumors, are both very guarded in the expression of their ideas on the origin of the cells of the so-called endothelial tumors. Ribbert especially considers the salivary mixed tumors as in all probability of epithelial origin, and his views on the general subject of endothelial new growths may be illustrated by the following quotation: "It is customary to make a diagnosis of endothelioma when, in spite of the carcinomatous arrangement of the cells, the organ in which the growth is found lacks epithelial cells. But it is to be remembered that developmental remains of epithelial tissue may be found in abnormal places; such as flat epithelium in the deep connective tissues of the neck, derived from the branchial clefts, or fragments of pancreas in the walls of the stomach or duodenum. It is quite probable that many of the so-called endotheliomata are in reality of epithelial nature; for it is exceedingly difficult at times to decide whether the cells occupy a tissue space or a lymphatic vessel. When an endothelial tumor reaches a certain size, new connective tissue and blood-vessels begin to be formed, and the resulting picture may vary greatly from the original growth. The cells then grow in more or less closely packed strands and, with the diminished fibrous tissue, a deceptive alveolar structure may be obtained in sections. A further appearance due to growth is the increasing closeness of relationship to the blood-vessels. The cells may become arranged in layers around these, giving a picture of angiosarcoma."

The remainder of the papers which have appeared during the past six years favor the view that the cells of the parenchyma are of endothelial derivation.

The evident and extreme diversity of opinion concerning the classification of the mixed tumors of the salivary glands, and the peculiar interest which attaches to them from their rarity and complicated structure, led the writer to examine a large number of growths which may properly be included in the class of mixed tumors. In the course of this study complex tumors were examined from the salivary glands, the lips, the

palate, the orbit, the antrum of Highmore, the lachrymal gland, the thyroid, kidney, ovary, testicle, and lung, as well as examples of some of the simpler types of endotheliomata from the meninges, the pleura, and the peritoneum. It seemed best to limit the present paper to the consideration of the tumors of the buccal and the salivary group, inasmuch as the embryological conditions underlying the formation of the tumors of other organs, especially the testicle and kidney, differ greatly from those connected with the origin of the salivary mixed tumors. The writer has been indebted for some of his material to the surgeons of several of the New York hospitals, and he wishes to express his obligation to Dr. Robert Abbe in allowing him to use the records of six cases; to Dr. Francis H. Markoe for the use of five cases; to Dr. Charles McBurney for the use of eight cases; to Drs. B. F. Curtis and C. L. Gibson for three cases each; to Dr. J. H. Blake for two cases; and to Dr. F. W. Murray for one case. Case XXV was kindly given to me by Dr. F. S. Matthews. Four other cases were put at my disposal by Dr. J. H. Larkin, to whom I am under obligation for slides and material from his large collections of mixed tumors. The other twenty-seven tumors are from the collection of the Department of Pathology, College of Physicians and Surgeons, Columbia University, the large material of which was put at my disposal through the kindness of Professor T. M. Prudden, whom I also wish to thank for much assistance and advice during the progress of this study. Of the total of fifty-nine tumors from the salivary glands, lip and pharynx, selected for this report, fifty-four may be considered as undoubted mixed tumors of the so-called endothelial type. Two might perhaps be considered by most observers as sarcomata; one may possibly be an adenoma, though it does not resemble other adenomata in my collection, which are undoubted growths of an epithelial nature. Case II is not a mixed tumor in the strict sense of the term, but is of interest from an embryological point of view.

No attempt has been made to give a full clinical and anatomical description of each case, as a long series of such reports



can be found in Volkmann and the other German writers just mentioned. No morphological description, however complete, will enable one to appreciate as much of the appearance of a tumor as a drawing, so that frequent references have been made to the plates instead of giving the microscopic details in full.

It will be frequently noted during the description of the morphology of the individual tumors, that references will be made to drawings from other specimens. This is necessary simply for economy in the number of plates. A considerable number of the drawings are intended as types, and will be referred to as such. For example, Plates I and VI, Fig. 1, though not drawn from the same tumor, show a morphology which is characteristic of a large number of the mixed tumors, and which may be designated as typically endothelial in nature.

#### DETAILS OF CASES.

CASE I.—St. Luke's, No. 2. Parotid tumor. The growth was removed from the left cheek of a male, aged thirty-nine years. The tumor had been noticed for two years, during which time it had grown slowly. The growth was hard, painless, and freely movable.

When removed the tumor was found to be roughly spherical. The surface was slightly lobular and smooth. A distinct capsule is present of from one to three millimetres in thickness. A portion of the parotid gland is still adherent to the dorsal aspect of the mass. The tumor measures roughly four by three by two centimetres.

The parenchyma of the growth is arranged in solid strands and in alveoli. The strands spread out in all directions through a soft cellular connective tissue and lose themselves in it. (Plates I and VI, Fig. 1.) The cells of the strands are spindle or oval in shape with large nuclei. The chromatin of the nuclei is evenly distributed, so that a net-work is not easily made out. From the tapering ends of the strands the cells often give off long filaments to the surrounding connective tissue. The alveoli are small and oval in shape. They often lie in the course of one of the solid strands. The centre of the strands is filled with a mucous mass staining blue with hæmatoxylin. In some places the alveoli are

suggestively like the alveoli of a secreting gland; but the general type of the growth is that which has been called endothelial. There are no pearls or spine cells in the sections examined. There is no cartilage. Elastic tissue is abundant. The remains of the gland which are attached to the growth are normal. The morphology of the tumor is similar to that shown in Plate I, Fig. 1. No recurrence of the growth has taken place after five years.

CASE II.—St. Luke's, No. 727. The tumor was removed from a seven-months-old female infant. The growth was noticed soon after birth, and its progress was slow for two months and then became very rapid. The tumor lies on the left side of face and neck over the parotid gland, with which it is in contact. Numerous dilated veins can be seen on its surface. It is easily reduced in size by pressure. It measures before removal seven by four by five centimetres. On gross examination after removal, the tumor is composed of fat tissue and soft fibrous tissue. The vessels are not very noticeable in the hardened specimen. There is no capsule.

Microscopic examination shows a diffuse cellular growth composed chiefly of oval and spindle cells. The tissue resembles embryonic connective tissue rather than sarcoma. In the masses of spindle cells can be seen occasional alveoli of cylindrical epithelium entirely distinct from the rest of the growth, which resemble the alveoli seen in the tumors regarded as of endothelial nature. There is a moderate amount of fat scattered through the specimen. No cartilage is present; no form of degeneration either in cells or stroma. Elastic tissue is not abundant. This tumor, though perhaps not properly classed as an endothelioma, seems of sufficient interest to include here, for it is an excellent example of a congenital tumor of the parotid region containing fibrous tissue of a cellular, embryonic type, and also distinct epithelial remains derived in all probability from rudiments of the parotid. No recurrence in three years.

CASE III.—St. Luke's, No. 1675. Male, aged forty-one years, who fifteen years before had noted a small, hard nodule below and behind the right ear. The tumor was quite painless and not tender. The growth had gradually increased in size until it now measures twelve by eight centimetres. The growth has taken place in an anterior direction, so that the tumor now lies chiefly anterior to the ear, extending for some three centimetres

along the border of the inferior maxilla. The ear is pushed forward and upward by the tumor. The form of the growth is irregularly oval, and presents a number of cartilaginous nodules which project three or four millimetres above the surface. Other portions are cystic. The tumor is not adherent to the surrounding tissues. The neighboring lymph nodes are normal. The growth was removed by operation without difficulty, and no recurrence has been reported in two years.

The tumor when hardened measured seven by five by five centimetres. The cut section was pale yellow with small bluish nodules of hyaline cartilage scattered through its substance. There are many small, softened areas filled with myxomatous tissue. Some of these have broken down and formed small cysts. The capsule is of fibrous tissue about two millimetres thick and contains a few small vessels. The microscopical examination of the tumor showed it to be very largely composed of cartilage and soft embryonic connective tissue. The cellular portion of the growth was only moderate in amount.

The cartilage is in general purely hyaline, with a few oval cartilage cells in the stroma. In places, however, the connective and elastic tissue of the tumor invades the cartilage, and it becomes more cellular, and contains many long branching and spider cells, the prolongations of which join in with the fibrous tissue of the stroma. In some portions of the tumor and in the capsule the connective tissue is quite dense, but in general it is very loose and softened with mucous degeneration. Hyaline degeneration of the connective tissue is also seen to a very considerable extent, often extending over large areas, in which all trace of fibrillation is lost.

Weigert's stain for elastic fibres shows the whole growth to be traversed by a fine net-work of elastic fibres penetrating the cartilage and surrounding the alveoli of the parenchyma cells.

The parenchyma cells proper are of the so-called endothelial type. That is, they are oval or polyhedral cells with oval, deeply staining nuclei, which line small alveoli and tissue spaces. They are in intimate relation with the surrounding tissues, and may give off prolongations which are lost in the connective-tissue fibrillar among which the cells lie. There is no connective tissue between the cells when they lie in compact masses, nor does the elastic tissue pass between them under these conditions. Some of the alveoli contain masses of homogeneous hyaline material.

CASE IV.—St. Luke's, No. 1745. The tumor was removed from the left parotid region of a man of fifty-nine years, who first noticed the tumor fifty-three years ago. It was then the size of a small nut and freely movable. For many years the growth was exceedingly slow, but in the last few months it has been very rapid. The ear is pushed back by the growth. The tumor is very hard and adherent both to the skin and the deeper tissues. It cannot be moved in any direction. Its surface is smooth. In the neck are a few large hard nodes which have appeared recently. The patient's general condition is good.

The tumor was removed with some difficulty, as it was adherent to the deeper tissues, and a large number of the cervical lymph nodes had to be removed. When hardened, the mass measured six by seven by twelve centimetres. It is pear-shaped, with the larger portion above over the parotid. The cervical fat is filled with hard, enlarged lymph nodes. The internal surface, directed towards the parotid, is rough from separation of the tumor from the underlying tissues. The outer portion directed towards the surface is smoothly encapsulated, and there is a thin capsule between the tumor and the remnants of parotid tissue. The cut section shows two different appearances. The superficial portions are transparent, with faint yellow strands running through them, the deeper are opaque and white. The nodes are also opaque and white.

Microscopical examination of the growth shows a similar variability in the tumor. The peripheral portions possess the morphology designated as endothelial (Plate VI, Fig. 1), with a soft, fibrous stroma and long branching strands and alveoli, some of the latter filled with hyaline material. The deeper portions are composed of the same endothelial structures infiltrated with carcinoma. The carcinomatous growth resembles that of an infiltrating epithelioma rather than that of a glandular carcinoma, such as one would expect in a carcinoma of the parotid. The cells are large and flat, staining deeply with eosin. In some areas intercellular spines can be seen. Mitotic figures are fairly abundant. The parotid, which is separated from the growth by a fibrous capsule, is normal in appearance, and contains but little carcinomatous infiltration. The nodes are filled with the carcinomatous new growth and very little lymphoid tissue remains.

In the opinion of the writer, the best explanation of the con-



CASE IV.—Epithelioma arising in a mixed tumor of the parotid gland.



dition is that the patient had since childhood a tumor of the endothelial morphology, and that the recent rapid growth is the result of the carcinomatous change which has taken place in the epithelial cells of the so-called endothelial new growth. That the carcinoma is not derived from the parotid seems probable, for the gland is not extensively invaded, as it would be if the carcinoma were primary. Landsteiner describes a similar case in which malignant changes had taken place in a chondromatous tumor of the submaxillary gland, with the formation of growths of an epitheliomatous character which had broken through the tumor capsule and infiltrated the surrounding tissues. The regional lymph nodes were not invaded, in which point the case differs from the above.

CASE V.—St. Luke's, No. 1906. The patient was a male, aged forty-four years; has always been well and strong. Six years before admission to the hospital he first noticed a swelling of the right cheek just above and anterior to the parotid gland. The tumor was freely movable in a vertical direction, but not laterally. It was not painful and was soft, feeling a good deal like a sebaceous cyst. The skin and mucous membrane of the cheek are not adherent to the growth. The removal of the tumor was carried out without difficulty, the growth being encapsulated and not involving any of the deeper tissues.

On removal it was found to be roughly oval, measuring five by four by five centimetres. The surface was covered with small nodules about five millimetres high. The cut section was uniformly opaque and of a dull yellow and white color. No cartilaginous areas could be made out.

Microscopical examination of the tumor shows a growth composed of dense fibrous tissue with only a small amount of parenchymal substance. The fibrous tissue is rather cellular in a few places, the cells being fusiform, with large oval nuclei and resembling the fibroblasts seen in granulation tissue. Scattered irregularly through the fibrous tissue are many open spaces lined in general with a single layer of flattened cells which stain deeply with eosin, much as is seen in cornified epithelium. The contents of all of these alveoli have not been preserved in Zenker preparation or in specimens hardened in alcohol and formalin, though hyaline masses are present in a few. Evidently the fluid was of a serous nature and contained but little solid matter. Some of

the spaces, however, can be explained by the fact that the cells which originally filled them have fallen out during the manipulation of the sections, for solid masses of cells resembling cornified epithelium are present in parts of the tumor. Some of these areas are quite extensive, and spine cells with epithelial fibrillations can be easily made out by suitable staining and the use of high powers. The central spaces of other of the alveoli are filled with large flat cells with faint nuclei and poorly staining cell bodies, which are much like the large flat epithelial cells seen in the alveoli of mammary adenomata in which the milk-ducts have been occluded by the tumor growth. It is evident that a considerable proportion of the parenchymal cells are of epithelial origin, though the morphology of the tumor is that described as endothelial. No recurrence in a year.

CASE VI.—The specimen was removed from a female seventy years of age. She had noticed a tumor on the inner surface of the left cheek, near the opening of Steno's duct, for at least twenty years. It was oval, movable, and quite painless. The mass had increased in size very slowly. The tumor was easily shelled out and measured about two by one and one-half centimetres. It was smoothly encapsulated and the surface was lobular. On cross section the texture was fine and the surface a yellowish white. A few scattered islands of cartilage, none over three millimetres in diameter, could be recognized by their transparency. Microscopically, the growth consisted chiefly of cartilage, soft embryonic connective tissue with spider cells, and abundant mucous degeneration, typical endothelial strands and alveoli, and, finally, well-formed epithelial pearls. The cartilage is of the hyaline variety and contains a good deal of elastic tissue. The cartilage passes imperceptibly into either the soft connective tissue or the closely packed cells of the anastomosing endothelial strands. Indeed, there are no sharp boundaries between the various tissues of the tumor. The connective tissue in the centre of the growth is very soft and contains but few cells, and these send out long fibrillæ which join with those from other cells and form a network, in the meshes of which is found the mucous substance staining deep blue with hæmatoxylin. In this tissue are seen occasional spherical cells with one or two nuclei. They exactly resemble the cells of hyaline cartilage. Epithelial masses are also present in the mucous tissue. They have no connection with the



surrounding structure, but lie isolated as small spherical groups of flattened cells. The so-called endothelial strands and alveoli possess the morphology common to these structures. (Plate II, Fig. 1.) The alveoli are filled with hyaline masses. In other portions of the tumor the fibrous tissue is more dense though still very cellular. The epithelial pearls are found chiefly in these areas. The pearls are either quite distinct from the so-called endothelial portions of the growth, or they lie in the course of one of the long branching alveoli of endothelial cells, or they can be seen lying in the solid strands of the endothelial cells. Finally, the epithelial cells may be seen lining the walls of small cavities in the tumor. A few cells in all these masses when stained by Kromayer's method and examined in glycerin or even in balsam show intracellular bridges and the fibrillations characteristic of epithelial cells. Only a certain number of cells show this morphology, and they are chiefly the cells which take on a deep eosin stain. The cells of the so-called endothelial type do not show any such structures. (Plate I, Figs. 1 and 2; Plate V, Figs. 1 and 2.)

CASE VII.—St. Luke's, No. 1592. The tumor was removed from a female aged fifty-six years. Three years before her admission to the hospital she noted a small nodule in left parotid region. For two years there was no increase in size, but of late the patient thinks there has been a slow but steady increase in the size of the tumor. Health perfectly good at present. The tumor measures after removal about two by three centimetres. It is lobulated and surrounded by a thin capsule. It is soft in texture, and there are a few areas of softening. Microscopically the tumor is very cellular, with the strands of cells separated from each other by a delicate fibrous stroma which has undergone hyaline degeneration, especially along the blood-vessels, which are moderately abundant. Some of the strands contain alveoli filled with hyaline material. No cartilage is present, nor definite epithelial structures, but an abundance of elastic tissue. No recurrence after a year.

CASE VIII.—St. Luke's, No. 522. Tumor was removed from the left submaxillary region of a woman of forty-seven years. She had noticed the growth for eleven years. It was removed, and about three months after the operation she noted a recurrence, which has grown slowly for two years and for the past month quite rapidly. It is now about two centimetres in diameter and

causes pain and difficulty in swallowing. The tumor is but slightly movable and has no sharp outline. The patient's condition is good. The tumor when removed was found not to be encapsulated and measures roughly some two centimetres in diameter. It is embedded in a mass of fat, into which it merges imperceptibly. The cut section is rather soft and translucent, without any marked macroscopic characteristics.

Microscopically the growth is composed of alveoli in a connective-tissue stroma. The centre of each alveolus is filled with mucus; the periphery lined with flattened cells. No cartilage, and but very little elastic tissue is present in the recurrence, though it is usually very abundant in the primary growths of this group of tumors. The elastic tissue in a recurrent mixed tumor appears to be practically all derived from that pre-existing in the connective or other tissue invaded by the growth.

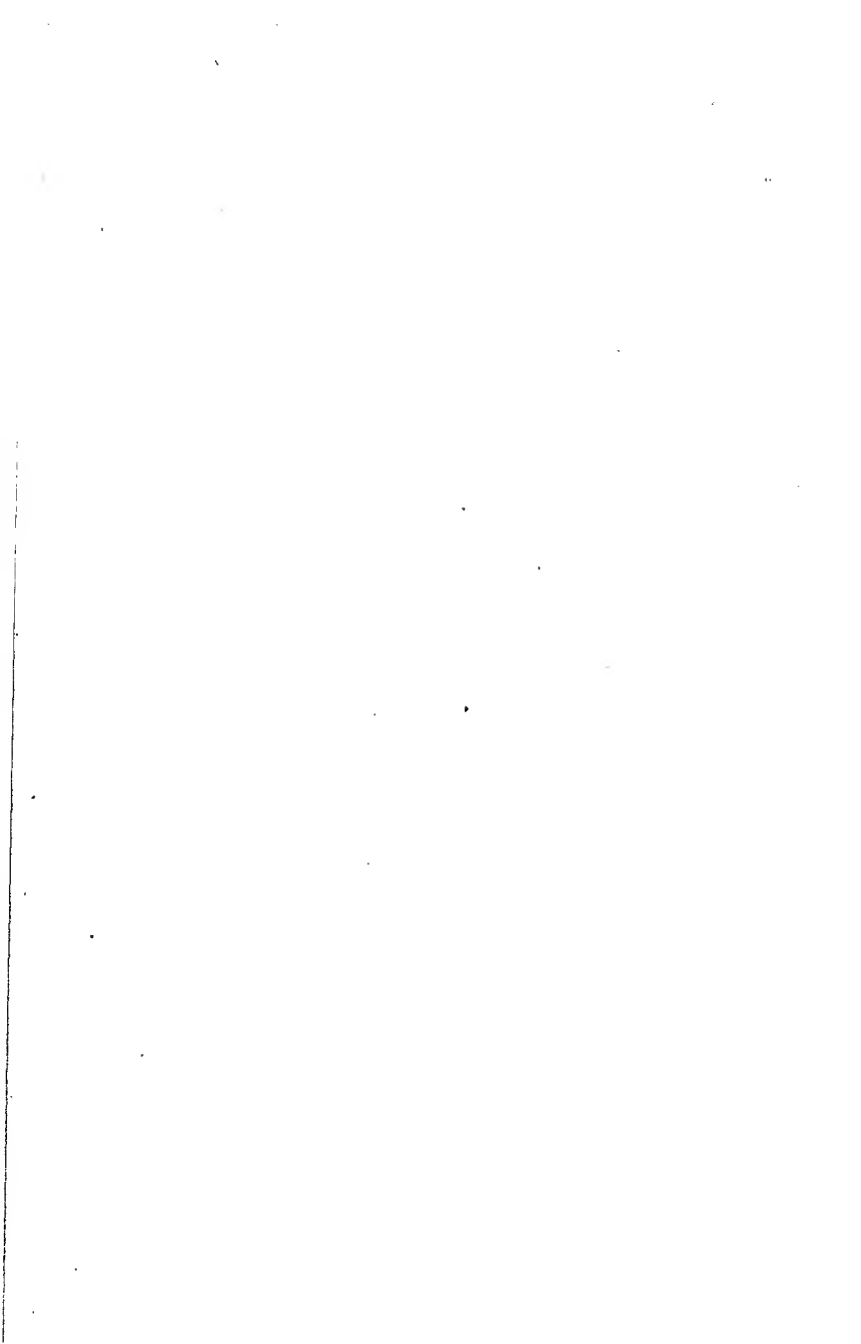
CASE IX.—St. Luke's, No. 1131. Male, forty-five years of age. A year previous to operation had noticed a small lump size of a marble just behind and below angle of right inferior maxilla. The mass was not tender or inflamed. Soon after the growth began to affect the patient's speech, and gradually the tumor was noticed to protrude more and more into the pharynx. For the past six months growth has been rapid. The tumor at present is the size of an orange, but is freely movable, and does not interfere with the motions of the lower jaw. No recurrence after two years.

Macroscopical examination of the growth shows it to measure eight by seven by six centimetres, the shape being roughly oval. The surface is slightly lobular. The consistency is firm and elastic in general, but there are harder and softer areas. On section the tumor is seen to be composed largely of cartilage lying in a soft fibrous matrix and containing a few small cysts. The whole is surrounded by a thin even capsule not over a few millimetres in thickness. The cartilage is of the hyaline variety and is quite transparent and of a bluish tint. The cellular portions of the tumor are opaque and yellow.

Microscopical examination of the growth shows that it is made up very largely of hyaline cartilage containing in different portions a variable number of cells. The cells have the morphology of those seen in normal cartilage. About the edges of the cartilaginous masses the cells are more abundant and lose their characteristic shape. They are often spindle-shape or even epithe-



CASE IX.—Large tumor containing cartilage chiefly.



lioid in form, and are arranged in long branching strands and spherical alveoli forming the so-called endothelial structure. The alveoli are filled with hyaline masses. Elastic tissue is not very abundant in the tumor as a whole, but in some portions of the cartilage there is a fine diffuse net-work of very fine fibres. In the cellular portions the strands are coarser and outline the alveoli.

CASE X.—The tumor is a recurrent parotid tumor from a male of about fifty years. The original growth was a small tumor of the left parotid about the size of an English walnut. It was reported as a mixed tumor. One year later there was a considerable diffuse local recurrence over the parotid region which was excised. The recurrence penetrated between the lobules of the parotid and could be distinguished from it by the yellow color of the tumor. The whole mass was removed, and no recurrence has taken place at the end of three years. The material removed was of the endothelial type with anastomosing strands of flat cells forming alveoli containing hyaline material. No cartilage was present; no epithelial pearls; no large amount of elastic tissue.

CASE XI.—St. Luke's, No. 411. The tumor was removed from a female aged twenty-six years. Five years previous to the operation a tumor the size of a pea appeared in the right parotid region; has grown slowly to the size of an English walnut. None of the lymph nodes of the neck are swollen. When removed, the tumor measured two and one-half by three by two centimetres. It is a flattened, encapsulated mass with a broad, irregular base. A small additional fragment is attached to the main mass by a pedicle.

Microscopically the tumor is chiefly made up of a soft cellular fibrous tissue with many nuclei and marked mucous and hyaline degeneration, the latter confined to the walls of the blood-vessels. Scattered unevenly through the whole are a few alveoli lined with flattened cells. A few of the alveoli contain hyaline material. No pearls or well-marked epithelial alveoli present. No recurrence in four years.

CASE XII.—St. Luke's, No. 630. The tumor was removed from a female fifty-six years of age. Five and a half years before admission to hospital she noticed a tender spot on side of neck with a small lump. There was some pain in tumor. The growth has been very slow and gradual. The tumor is hard and lobular with a smooth surface. It lies below the angle of the jaw on the right side and is the size of a hen's egg. Skin is movable over tumor,

and the latter is movable on the deeper tissues. The tumor was easily enucleated, except for one point which was adherent to the digastric muscle. It measures after removal five by three by two and one-half centimetres. The surface is lobular but smoothly encapsulated, except for the area which was adherent to the digastric. On section the periphery of the growth is firm and very cellular; the centre, however, has softened, and there is a ragged cavity from which the degenerated tissue has escaped. No areas of cartilage can be seen.

Microscopically the growth is very cellular, the cells being arranged in tubules and long strands. The cellular areas in places have been distended by collections of mucus forming a single cyst, or the mucus may have collected in a large number of separate areas forming a large number of cysts with cellular walls, the whole walled about with trabeculae of soft connective tissue. The general type of the growth corresponds to what has been called cylindroma. (Plate IV, Fig. 2.)

Though blood-vessels are not numerous, there are many extravasations of blood in the tumor, probably the result of the operative handling of the soft tumor. No cartilage and no pearls are to be seen. Elastic tissue abundant.

CASE XIII.—Recurrence of the above in about a year. The recurrence is local and in the form of a diffuse infiltration of the tissues with cells of the same type as before described: that is, flat or oval epithelial-like cells arranged in alveoli with a mass of mucous secretion in the centre. In many years the alveoli are not developed perfectly, and the cells have penetrated the tissues in long strands and masses of small cells retaining the morphology of the original tumor. No further recurrence after two years has been noticed since the thorough removal of this recurrence. The regional lymph nodes are not invaded. Very little elastic tissue in the recurrence.

CASE XIV.—St. Luke's, No. 659. Parotid tumor removed from a male aged thirty-three years. Eleven years ago first noticed a lump about the size of a small nut, one and one-half centimetres in diameter. It increased very slowly in size and was extirpated eight years ago. After this there was some induration of the scar, but nothing was seen until two years ago, when a small recurrence was noticed, slowly increasing to present size. There is no pain nor tenderness. No swelling of the neighboring lymph nodes.

The tumor occupies the right parotid region. It is adherent to the deeper tissues and to the skin. Its consistency is hard; it is quite lobular. The form is irregularly oval, somewhat larger below than above, and flattened from before backward. There is no distinct, smooth capsule, but the tumor substance proper is embedded in dense fibrous tissue, and does not ramify among the surrounding tissues. On section it is quite tough and firm, with harder and softer areas. The soft areas are quite translucent and resemble cartilage. The wound did not heal primarily, but showed a low grade infection with a corresponding rise of temperature up to 102.5° F.

The microscopical examination shows the tumor to be of a very variable structure. The whole growth is divided into lobules by connective-tissue bands, which are rather dense and contain a few spindle cells. Inside of these lobules are the following structures: (*a*) In some of the lobules the centre is made up of very fine mucous tissue containing only a few branching cells. These are the transparent areas resembling cartilage. (*b*) Areas with some mucous tissue, but in addition ramifying strands of spindle and oval cells. (*c*) Other lobules are filled with closely packed cellular masses resembling sarcoma, except that there is little or no connective tissue between the cells. (*d*) Areas which bear a strong resemblance to atrophied parotid gland with a few excretory ducts lined with cylindrical epithelium scattered through the mass of alveoli. Some of these alveoli contain hyaline material. No cartilage is found in the tumor and no pearls, but epithelial tubules lined with cylindrical epithelium are abundant, as is elastic tissue. (Plate VII, Fig. 1, and Plate I, Fig. 2.)

CASE XV.—St. Luke's, No. 1055. Tumor removed from parotid region of a female aged forty-eight years. Nine years before the patient's admission to the hospital she noticed a small nodule behind the lobe of the left ear, which gradually increased in size for five years and then began to grow more rapidly. The tumor is now about the size of a small orange. No pain, no general symptoms, no loss of flesh have been noticed. The tumor feels somewhat elastic when palpated and is slightly movable in all directions. It lies just below the lobe of the left ear and has pushed the lobe upward by its growth. At operation, the tumor was easily shelled out from the tissues of the neck. No enlarged lymph nodes were found. The tumor when removed was an

irregularly oval mass with lobular surface and a capsule. Its dimensions were about four by five centimetres. On cross section the tissue is firm, not cystic, and contains no cartilage. In the clear, transparent stroma can be seen the opaque, yellowish areas of the cells of the parenchyma. The microscopical examination shows the growth to be composed of tubular acini lined with large round and oval cells. The lumen of the alveoli contain hyaline masses staining red with eosin and yellow with acid fuchsin. The stroma is not very cellular and shows advanced mucous degeneration. No cartilage and no true pearls can be found. Elastic tissue fairly abundant. No recurrence in two years.

CASE XVI.—College, No. 6314. The tumor was removed from the parotid region of a male fifty-seven years of age. One year before operation he noticed a small nodule the size of a pea in front of the left ear. The mass is now the size of a hen's egg. It is movable under the skin and on the deeper tissues and the jaw. In some portions of the growth the consistence is soft and fluctuating; in others, hard. The tumor was shelled out of the substance of the parotid gland without difficulty. It contained a cyst of considerable size. Microscopically the tumor shows a diffuse growth of oval and spindle cells arranged to form alveoli. These alveoli and branching strands of cells lie in a dense connective-tissue stroma. No cartilage is present and no epithelial structures. Tumor recurred locally in six months. No recurrence after second removal. The mass removed at the second operation includes portions of the muscles of the face and neck and lymph nodes from the anterior triangle. The morphology of the recurrence is different from that of the primary growth. It resembles angiosarcoma in the fact that the cellular masses surround the blood-vessels. There are, however, portions of the growth in which the alveolar arrangement is preserved with long branching strands of cells lying in the tissue spaces. The lymph nodes show chronic hyperplasia, but no invasion by the cells of the tumor.

CASE XVII.—St. Luke's, No. 918. Parotid tumor. The patient was a man aged fifty-five years, who had always enjoyed good health, with the exception that five years previous to his admission to the hospital he noticed a slight swelling on the left cheek above and anterior to the parotid. At that time it was about the size of a bean. Growth has been slow except for the past year, during which the increase has been rapid. At present it is about



the size of a walnut and very hard. It is adherent to the skin, but movable over the deeper tissues. Tumor was easily removed at operation, and was found to lie upon the anterior border of the parotid gland. When hardened, the growth measures four by three by three and one-half centimetres. It is slightly lobular, and the cut section is pale and shows a large amount of fibrous tissue. Microscopically the growth contains a large amount of fibrous tissue, which is dense and contains only a very small amount of hyaline degeneration. The parenchyma is of a distinctly adenomatous type with papillary outgrowths into the alveoli. The papillary projections and the alveoli are lined with high cylindrical epithelium, and the lumina are filled with mucus staining blue. In some areas the alveoli are closely filled with cells. At the periphery of the tumor the cells form long strands lining the lymph spaces and resemble closely the so-called endothelial type. No cartilage is present and no epithelial pearls. The tumor would be classed as an adenoma from a morphological stand-point, and yet certain portions are of the same appearance as is seen in the endothelial tumors. No recurrence.

CASE XVIII.—College, No. 1399. The tumor was removed from a woman about forty-five years of age. One year previous some enlarged nodes had been removed from the neck just below the ear and behind (?) the sternomastoid muscle. They were considered by the operator to be tuberculous, but no examination was made. One year later there was a recurrence at the same place, and a more thorough excision was carried out. The material consists of a few fragments of a tumor which measured about two centimetres in diameter. There is a distinct capsule on portions of the fragments. Microscopic examination shows the growth to be of a cylindromatous type, with alveoli filled with mucus and surrounded by a connective-tissue stroma very poor in cells. (Plate IV, Fig. 1.) No recurrence after three years.

CASE XIX.—College, No. 5673. The tumor was removed from a male aged sixty years. It has been present in the side of the neck just below inferior maxilla for five years, increasing slowly in size. Specimen is a small, roughly spherical, lobulated tumor, about 2.5 centimetres in diameter. The section of the fresh tumor shows it to be enclosed in a rough fibrous capsule from two to five millimetres thick. There is no evidence that the growth has extended beyond the capsule into the surrounding tissues. The

cut section is pale, irregularly lobular, and the tissue has much the same consistence and elasticity as cartilage, though it is not translucent. There are a few small hemorrhages into the centre of the tumor, but no necrosis or softening.

Microscopically the growth is composed of a rather dense fibrous stroma, in which are seen larger and smaller areas of large flat cells of an epithelioid type. These cells have large oval nuclei with a well-marked chromatin net-work. They lie in close contact with the smaller blood-vessels and capillaries, and the general alveolar arrangement is determined by this relationship. No connective tissue can be made out between the cells and the elastic tissue fibrillæ, which are rather scant in the tumor, only surround the cell areas, and lie along the vessels, but do not penetrate between the cells as in so many of the mixed tumors. (Plate III, Fig. 3.) No spine cells or pearls are present, no cartilage, embryonic, connective, or lymphoid tissue.

This tumor, which was originally considered as a primary endothelioma of a lymph node, seems more properly defined as a sarcoma of the alveolar type despite the fact that there is no connective tissue between the cells. Ribbert has called attention to the fact that connective tissue is missing between the cells of a considerable number of the sarcomata, especially in the group of angiosarcomata with large cells. The reasons for considering the tumor as arising in a lymph node are based solely upon the opinion of the operator who removed the growth; under such conditions any small spherical tumor is liable to be classed as a lymph node. It is true that the morphology of the growth slightly resembles the endothelial hyperplasias of the spleen recently described by Bovaird, Grancher, and others, but the numerous mitotic figures which are present in the growth under consideration—four or five often being visible in a single field—would point rather to a rapidly growing malignant tumor than to a chronic hyperplasia as in the splenic tumors mentioned above. The absence of any embryonic tissues and cartilage certainly renders doubtful the possibility of the tumor being of congenital origin. No recurrence is recorded, though two years have elapsed since the operation.

A few cases similar to this tumor have been described (Putiata, Böttcher, Chambard, Zahn, Hoffman, Volkmann), but their morphology is not easily determined from the descriptions given. Ziegler figures a similar tumor in his text-book.

CASE XX.—College, No. 273. Mixed tumor of the pharynx. No history is recorded except that the growth was a very large one, filling the cavity of the pharynx so that the point of origin could not be determined. The mass when removed was irregular in shape and measured about seven by five by four centimetres. The consistence of the tumor was soft, and areas of mucous tissue could be distinguished by their transparent appearance. Microscopical examination of the growth reveals three groups of tissues,—connective tissue with advanced mucous degeneration; fat tissue; and soft connective tissue in which lie branching strands of large flat and polygonal cells. The centres of some of the strands contain hyaline material staining red with cosin. Elastic tissue and mucous degeneration abundantly present in all portions of the tumor. The arrangement of the large epithelial-like cells is of especial interest and will be considered in detail.

The walls of the long tube-like alveoli are lined with two distinct layers of cells (Plate II, Fig. 2),—one, the small, flat endothelial-like cells with deeply staining nuclei and small cell bodies such as are seen lining the tissue lymph spaces and smaller vessels; the other cells are large epithelial-like cells with large pale nuclei and a well-marked nuclear net-work. These cells form a single layer over the above-mentioned endothelial cells and are not very firmly adherent to them, for in the process of hardening a long strand of these cells can frequently be noticed to have become detached from the underlying layer of endothelium. (Plate II, Fig. 2.) Two interpretations are possible; first, that the cells are produced by a new growth of the underlying layer of endothelium; and, second, that they are tumor cells which have grown into the lymph spaces and more or less completely filled them, just as one can easily observe in the periphery of a lymph node during the early stage of the invasion by a carcinoma. (Plate III, Fig. 1.) The cells of the carcinoma may be seen in the lymph spaces as a single layer of cells lying on the normal endothelium lining.

The first explanation is that given by Volkmann and those who believe in the endothelial origin of the large flat cells of these tumors. The second point of view has two facts to support it; one is that when the endothelial cells proliferate, as can be seen in various places along the wall of the alveoli, they form masses of small cells with the same deeply staining nuclei as can be seen

lining normal lymph spaces, and these masses thrust aside the large flat cells and form small protrusions into the lumen of the alveolus. (Plate III, Fig. 2.) The second fact is that alveoli are found which can be traced for some distance as tubes lined with cells and then end in a small compact mass with closely packed, concentrically arranged cells which resemble epithelial pearls and contain spine cells. According to the second idea, then, the large flat cells are probably epithelial in origin and spread out through the tissues along preformed lymph spaces, leaving the normal endothelial lining intact. Taking the tumor as a whole, the cellular portion forms but a small part of the growth, the alveoli and pearls are scattered throughout a very abundant mucous and fibrous tissue which often contains fat cells. The growth is to be interpreted, in the opinion of the writer, as a tumor arising from a congenital remnant left during the formation of the pharyngeal space, and containing epithelial cells which were destined to form glands, but the normal differentiation did not take place, and the epithelium still retained an indifferent type, with a tendency to revert to the type of squamous epithelium such as lines the pharynx.

CASE XXI.—College, No. 2136. Tumor of the vault of pharynx. The growth was removed from a male aged sixty-five years. The tumor had been noticed for a year, gave few symptoms, and was the size of a hen's egg. It was removed by wire snare. The tumor is made up of anastomosing strands of cells which lie in a loose stroma. This distribution of the cells gives the section a reticulated appearance. In other portions of the growth the cells are crowded together in larger and smaller alveoli. The centres of these cell masses are degenerated, contain mucin and hyaline material. The connective tissue is also the site of hyaline degeneration. No record of recurrence. No cartilage; no epithelial pearls.

CASE XXII.—College, No. 2079. The tumor was removed from a female thirty years of age. It was encapsulated and oval in form, measuring four by three by three centimetres. It had been present in the soft palate for two years. The cross-section of the growth shows a fine, even surface, with a few trabeculae crossing it and small cartilaginous areas scattered through of irregular size; the largest, perhaps, three millimetres.

Microscopically the tumor is composed of a diffuse cellular

growth of spindle and flat cells with but little connective tissue. The cells show but little alveolar arrangement, but in a few places there are distinct alveoli with high cylindrical epithelium lining the walls. The cartilage is in small amount and contains a good deal of elastic tissue. No epithelial pearls.

CASE XXIII.—College, No. 7315. The tumor was removed from a female twenty-six years old. It was situated on the roof of the mouth near the median line and just in front of the folds of the soft palate. The size is roughly two by two by one centimetre. The surface is smooth and slightly lobular. The morphology is endothelial in type, with rather abundant cells and only a moderate amount of stroma. No cartilage, but abundant and elastic tissue.

CASE XXIV.—College, No. 10,042. Recurrence in a year. Tumor had been noticed by the patient for only ten days before its second removal, so that the growth must have been slow. Its dimensions are two by two by five centimetres. Sections show the same morphology as before. The strands of cell masses have invaded some of the mucous glands of the soft palate and have produced a very curious picture; the tumor cells forming alveoli which lie in close contact with those of the gland, and are at times difficult to distinguish from the latter, the resemblance is so close. No cartilage in the recurrence. Elastic tissue very abundant, outlining the tumor alveoli and forming a dense network throughout the whole growth, though there is less than in the primary.

CASE XXV.—The specimens were removed from a woman about forty-five years of age, who had had a submaxillary new growth in the side of the neck some twenty years before. This was imperfectly removed, and numerous recurrences have taken place which have necessitated operative interference almost every year since. The growth still remains confined to the lateral aspect of the neck, and the general condition of the woman is good. The specimens under consideration represent the last three removals. The numerous fragments show traces of a capsule surrounding them and on cross section a uniform pale cellular surface. The microscopic picture varies somewhat in the earlier and later recurrences. In the earlier ones the type is still distinctly that which has been considered endothelial with anastomosing strands of cells lying in a connective-tissue stroma.

The later recurrences have lost their characteristic morphology and resemble to a certain extent the true sarcomata with flattened cells. There still remains, however, something in the aspect of these sections under the microscope that is suggestive to any one who has seen a number of the mixed tumors, something in the shape and even staining of the cell nuclei and the arrangement of the cells that differs from the ordinary picture of sarcoma. A few spindle-shaped connective-tissue cells lie between the masses of tumor cells, and these have been stained and figured by a number of observers, notably Barth, as an evidence of connective tissue between the cells of the mixed tumors. The case is chiefly interesting because of the large number of recurrences and the comparatively benign character of the growth. No involvement of the cervical lymph nodes has taken place. (Plate VI, Figs. 1, 2, and 3.)

CASE XXVI.—Old No. 1598. The patient was a male aged forty-four years, who had a small nodule on the upper lip for two years. The tumor was removed and recurred in two years. The tumor under consideration is this recurrence. It measures about one centimetre in diameter. It lies in the tissues of the lip near the surface, but covered by the superficial epithelium. The sebaceous glands near the surface are compressed and lie flattened out on the capsule of the tumor. The latter does not infiltrate the deeper tissues. It is composed of small nodules of mucous tissue and hyaline cartilage. The mucous-tissue areas contain branching strands of cells and alveoli. The latter are in general lined with flattened cells, but in a few areas the cells are high and cylindrical, with the nuclei near the basement membrane. The cartilage is hyaline. Elastic tissue is abundantly present in the tumor.

CASE XXVII.—College, No. 2009. The tumor is recorded as having been present for a number of years in the upper lip. It was neatly encapsulated, and was shelled out of its bed by incising the mucous membrane of the inner surface of the lip. The tumor as removed is about the size of a bean, oval in form, and smooth of surface. It contains no visible areas of cartilage. No record has been preserved of a recurrence. Microscopically the tumor is composed of anastomosing strands of cells in a soft cellular stroma, the latter containing areas of mucous degeneration. Large alveoli filled with hyaline material are present

in portions of the growth. No pearls or distinct epithelial structures are present. A moderate amount of elastic tissue is present.

CASE XXVIII.—College, No. 2411. Female aged thirty-four years. The tumor was first noticed when patient was thirty-two years of age. It was under the ramus of the jaw on the left side. Removed after six months' fairly rapid growth. Recurrence after ten months. Second recurrence after eight months. Third recurrence after six months, involving all the left parotid region and the deeper tissues of the neck. Fourth recurrence six months later. Lymph nodes not invaded. Only portions of the various tumors have been preserved. The microscopic morphology is the same in all. The parenchyma is composed of oval or spindle cells with an alveolar arrangement, the alveoli often containing hyaline masses. The stroma shows some mucous degeneration. In the later recurrences the alveolar arrangement is less marked, and at first glance the morphology is suggestive of sarcoma, but occasional areas still show traces of the alveolar types. No cartilage in the growth, and no epithelial structures.

CASE XXIX.—College, No. 6560. The tumor was removed from the left parotid region of a male aged thirty-one years. It had been present for four years. During the last year growth had been rapid. The tumor is now the size of a small orange, is elastic and movable on the deeper tissues and under the skin. Easily removed at operation by shelling out the encapsulated tumor from the parotid substance. Microscopically the growth consists chiefly of dense connective tissue containing a few spindle cells with marked hyaline degeneration of the stroma. In a few areas there are masses of spindle and stellate cells lying in soft connective tissue which has undergone mucous degeneration. Towards the periphery of the growth, close under the fibrous capsule, the morphology is that of the endothelial type, that is, alveoli and a few solid strands of cells. Alveoli contain hyaline masses. No pearls or flat epithelium are present in the tumor, but there are a few ducts lined with high cylindrical epithelium and containing masses of flat cells evidently derived from the degeneration of the lining epithelium. No cartilage is present and no lymphoid tissue, but there are a few areas of fat tissue. The tumor has not recurred in the two years since the operation.

CASE XXX.—College, No. 7479. The tumor was removed from the right side of the neck of a male patient aged sixty-five years. For two years a mass had been noticed protruding into the pharynx just in front of tonsil. It has slowly grown during that time, and now projects more externally than internally, and at about the angle of the jaw. The tumor was movable in the deeper tissues and of oval form, about the size of a hen's egg. When removed, the growth was found to be a lobular encapsulated mass with an area of softening in the centre. Sections of the growth show it to be a typical tumor of the endothelial type with a great deal of mucous degeneration of the connective-tissue stroma. No cartilage or epithelial structures can be found and no lymphoid tissue. The absence of the lymphoid tissue shows that this tumor is not derived from one of the branchial clefts, though its softened centre and position were suggestive. No recurrence of the growth in two years.

CASE XXXI.—College, No. 2141. Submaxillary tumor. The tumor was removed from a female aged forty-five years. The tumor was first noticed as a growth under the body of the left inferior maxilla some nine years before. The growth was slow. The tumor measures three by four by three centimetres. Attached to it is a large mass of the submaxillary gland. It is partially encapsulated. Microscopically the growth is an exquisite example of what has been designated cylindroma. The tumor is composed of alveoli, which may be either solid or partially distended with mucus or wholly distended, so that the cells form a flattened ring at the periphery. The most frequent condition is, however, a partial distention, with many small spherical areas of mucus in each alveolus. This gives the tumor its peculiar morphology. (Plate VII, Fig. 2.) No cartilage or definite epithelial structures are present. The submaxillary gland has been invaded by the tumor, and the compressed alveoli of the gland are with difficulty distinguished from the alveoli of the tumor. The tumor recurred locally in two years, but after a second removal there has been no recurrence in three and a half years.

CASE XXXII.—College, No. 9565. Tumor from submaxillary region. The growth is hard, lobular, and roughly spherical. Its greatest diameter is about four centimetres. Cross section is pale, smooth, and rather homogeneous. The capsule is very thin. No remnants of submaxillary tissue present. No macroscopic



areas of cartilage. Microscopically small masses of cartilage are fairly abundant, and also a good deal of myxomatous connective tissue. The main portion of the tumor follows the conventional endothelial type, but scattered throughout the whole growth are a considerable number of epithelial pearls. These are either quite discrete or are in intimate connection with the tubules and strands of the endothelial portions. Spine cells can be seen in a few of the pearls, especially those in the myxomatous tissue (Plate IV, Fig. 1.) Elastic tissue is very abundant. No recurrence in six months. This case resembles the one described by Wilms, in which he showed that epithelial structures are not confined to the parotid group of tumors as Hinsberg had thought. This observation renders doubtful Hinsberg's supposition that the epithelial structures might be derived from the epithelial anlagen destined to form the ear-drum.

CASE XXXIII.—No record is preserved of this tumor, the fragments of which are in the collection of the Department of Pathology, College of Physicians and Surgeons. The label records only that the tumor is a mixed enchondroma of the parotid. Sections from the fragments of tumor which remain show that the growth is in the main of an alveolar type with scattered areas of cartilage and mucous degeneration. The alveoli are lined with flat cells and contain masses of hyaline material. In several places in the sections well-formed pearls can be seen with epithelial spine cells. Elastic tissue is very abundant throughout the growth, especially about the alveoli.

CASE XXXIV.—V. C. 9. Tumor of parotid. No history is recorded of this specimen. The material consists of a few blocks of tissue evidently from a tumor of six or eight centimetres in diameter. Some of the fragments show a distinct capsule. Microscopically the tumor is divided by trabeculae into alveoli of irregular size. These alveoli are lined and filled by a cellular mass which also forms alveoli. These smaller alveoli are often surrounded by a single layer of cells and contain masses of mucus which stain deep blue with hæmatoxylin. No cartilage is present and no great amount of elastic tissue. At one side of the growth is a remnant of much compressed parotid gland, but no invasion of the gland tissue by the tumor has occurred. (Plate VII, Fig. 3.)

CASE XXXV.—The tumor was removed from the outer surface of the lower lip of a male patient of thirty-three years. The

growth was oval in form and measured two by one and one-half by one and one-half centimetres. It had been noticed as a small mass about the size of a pea since childhood, and had grown slowly ever since. The only discomfort noticeable was due to the mechanical interference with swallowing and speaking. An ulcerated surface had been noticed for the past month on the most prominent portion of the tumor. The tumor was movable in the tissues of the lip but quite closely adherent to the skin, so that it was impossible to shell out the growth. Microscopic examination of the tumor shows it to be of the endothelial type with a large amount of mucous degeneration of the connective-tissue stroma. Very few alveoli are to be seen, the cells lying, as a rule, in anastomosing strands embedded in the mucous tissue. There is no cartilage present and no epithelial structures. Elastic tissue is very abundant. About the periphery of the growth, but external to the capsule, are many mucous glands, in some of which the alveoli have become atrophied by pressure, in others are still normal. The tumor has not recurred in six years.

CASE XXXVI.—Old Nos. 232, 241, 242. The material consists of a tumor from the parotid region with the fragments removed from a series of five recurrences, extending over some five years' time. There is no other history connected with the specimens. The primary growth is of the conventional endothelial type with abundant strands of cells occasionally forming alveoli which are filled with hyaline material. No cartilage is present, and only a moderate amount of elastic tissue. The various recurrences are of interest only as they show the gradual tendency of the growth to assume a sarcomatous type with only occasional suggestions of the alveolar structure of the original. In the last recurrence, however, the morphology is quite markedly alveolar, though not quite as evident as in the original. The case is of interest only to illustrate the possibilities of frequent local recurrences without involvement of the internal organs or the neighboring lymph nodes.

CASE XXXVII.—Old No. 465. The tumor was removed from a male thirty-eight years of age. He had had a small parotid tumor for fifteen years. For the last six months the tumor has grown rapidly and is now of oval form, measuring six by four by four centimetres. There is a thick, rough, fibrous capsule which surrounds the periphery of the tumor, and a mass of the

parotid gland is embedded on the internal surface of the growth. The cut surface is divided by trabeculae with numerous lobules measuring from five to fifteen millimetres in diameter. No cartilage can be seen. Microscopically the tumor is cellular and follows generally the cylindromatous type, though a few areas are composed of solid masses of cells. Very little fat is present in the tumor and but little mucous or hyaline degeneration. Elastic tissue is also scarce. The parotid is normal. No pearls or epithelial structures are to be seen.

CASE XXXVIII.—The tumor was from a male of about thirty years of age, and had been present on the inner aspect of the upper lip in the median line for many years. It was easily shelled out by incising the mucous membrane over it. When removed it was an encapsulated mass of oval form with a diameter of eight millimetres. Sections show the tumor to be composed of branching strands of oval cells in a stroma of soft connective tissue with much mucous degeneration. No epithelial structures, no cartilage, but a good deal of elastic tissue is present.

CASE XXXIX.—Old No. 573. An adenoma of the parotid gland. No history has been preserved of the tumor and the entire specimen consists of four fragments each about two centimetres square and five millimetres thick. The microscopical appearance of the growth is that of a true adenoma or adenocarcinoma of the parotid. It is composed of a dense fibrous stroma, the trabeculae of which outline areas of cell alveoli. These alveoli are lined with one or two layers of cylindrical cells with large oval nuclei and a well-marked chromatin net-work, differing in this latter detail from the so-called endothelial cells. The alveoli, as a rule, contain no secretion. Remains of the ducts of the parotid are scattered through the tumor, and at one portion of the section normal parotid gland tissue can be found in close contact with the tumor cells. Another portion of the tumor shows the morphology of what has been called the endothelial type. There are long tubular alveoli lined with flattened cells; smaller alveoli containing hyaline secretion, and also alveoli containing double rows of lining cells such as have been figured in Plate II, Fig. 2. No cartilage and no pearls are to be found. Elastic tissue is fairly abundant. The case is reported here merely to show that morphology counts for little in the final decision as to the histogenesis of the cells of the salivary tumors, because in a growth evidently epithe-

lial in nature, areas can be found in which the morphology alone would lead one to consider the tumor as endothelial, just as in many cases of the small congenital epithelial tumors of the skin a cylindromatous arrangement of the tumor cells is not infrequent.

CASE XL.—Old No. 639. The tumor is from a woman aged fifty-eight years. Eighteen years before the present operation, a small growth over the parotid was removed by the action of caustic. The tumor has been growing ever since. The growth is of oval form with the inner surface flattened, and measures eight by seven by five centimetres. It is encapsulated on its outer surface and somewhat lobular. The inner aspect is rough from the severing of adhesions to the deeper tissues. The cut section is fine in texture and pale with transparent areas of mucous tissue and cartilage. There are a few hæmorrhages into the substance of the growth. No well-marked trabeculæ are present. Microscopically the growth is of the cylindromatous type with few cysts. The fibrous tissue is rather dense and the cells few and spindle in form. A few areas of hyaline cartilage are to be seen, and in some places a large amount of mucous degeneration has taken place in the connective tissue. In one portion of the growth are a few alveoli lined with high cylindrical epithelium, but these are all confined to a limited area and are not generally found. There is also an area which resembles a cellular sarcoma with cells closely packed about the vessels. The tumor contains a moderate amount of fat and is abundantly supplied with elastic tissue. There is no history of a recurrence after removal.

CASE XLI.—St. Luke's, No. 696. Recurrence after removal of a parotid tumor. The patient was a male from whose parotid region a large mixed tumor had been removed six months before. No local recurrence was noticed after the operation, but the patient gave symptoms of pulmonary and other metastases. A small subcutaneous nodule was removed from the side and showed a large-celled sarcoma with a tendency to alveolar arrangement of the cells. No further record of the case has been obtainable. The morphology of the growth is like that of the following case.

CASE XLII.—St. Luke's, No. 1590. Recurrent sarcoma of parotid. The patient was a male twenty-eight years of age, who had had a tumor removed from the parotid region four months before. The original growth had been noticed as a small nodule for several years. Several months before its removal the growth



CASE XI.11.—Recurrent sarcoma of parotid.



had become more rapid. No sections of the original tumor were obtainable, but the patient said the tumor had been hard and easily movable. The recurrence is a conical mass projecting from the surface of the left parotid gland. It is about four centimetres high and six centimetres in diameter at the base. The skin over the tumor is reddish, adherent, and the superficial veins are well marked. The growth is fixed to the parotid. On section, the tumor is firm, except for one area of softening, and contains no cartilage.

Microscopic examination of the growth showed it to be a large polyhedral celled sarcoma of the conventional type, with a more or less marked alveolar arrangement of the tumor cells. The only noteworthy features are the enormous number of mitotic figures present in the cells of the tumor and the slight amount of invasion of the parotid tissue. The parotid glandular tissue is atrophied in many places and replaced by connective tissue in which is a large amount of mucous degeneration. The morphology of the tumor is the same as in the recurrent Case XLI. The patient died from operation shock.

CASE XLIII.—Old No. 760. The specimen is a tumor of three years' duration, which is situated at the angle of the jaw superficial to the deep cervical fascia and quite movable under the skin and on the deeper tissues. It is oval, measuring about three by three by four centimetres, and smoothly encapsulated. The cut section shows a uniform pale cellular surface with small islands of hyaline cartilage scattered through it.

The microscopic examination of the growth shows it to be composed largely of a cartilaginous matrix in which lie numerous strands of cells and alveoli. The alveolar walls are lined in many places with high cylindrical epithelium, and a few areas are present in which faint intercellular bridges can be made out. No pearls are present. There is a very abundant elastic tissue network in the cartilage. The fibres also pass between the cell masses and form walls about the alveoli. This large amount of elastic tissue seems to be rather characteristic of these tumors, for Spuler has not found much elastica in the chondromata.

CASE XLIV.—Old No. 1400. Growth was removed from a male aged thirty years, after a slow growth of two years. The tumor was situated at the angle of the jaw, lying on the parotid gland. It measures after hardening four by five and one-half

by three and one-half centimetres. There is a fairly complete capsule over the various portions of the tumor, and this capsule sends off trabeculæ which divide the tumor into a series of lobules resembling those seen in a section of the pancreas. Small areas of cartilage can be seen in one portion of the growth.

The microscopical examination shows the tumor to be of the ordinary morphology generally known as endothelial with alveoli filled with hyaline material and walled with flattened cells. There are also long branching strands of cells of an epithelial type which form a meshwork throughout the soft fibrous stroma. In places the solid strands form pearl-like structures with concentric layers of closely packed cells which stain strongly with eosin and show no nuclear structure. At the periphery of these pearls and in some of the strands of flat cells intracellular bridges and fibres can be made out. A small fragment of compressed parotid and some skin are to be seen in some of the sections. Neither tissue is invaded by the growth, but both lie outside the fibrous tissue capsule of the tumor. The tumor is evidently a mixed tumor containing both epiblastic and mesoblastic tissues. No record of patient's further condition.

CASE XLV.—Old No. 1679. The specimen was removed from a male of sixty-three years. The tumor had grown for a year from the surface of the superior maxilla. No other history is recorded. The material as preserved in the collection of the Pathological Department is composed of a number of irregular masses which altogether form a tumor the size of a small lemon. The skin is adherent to the external surface of the growth, but is not invaded by the cells of the neoplasm. The cut surface is smooth and of fine texture. No cartilage can be seen. A thin capsule surrounds the peripheral portions of the fragments. Microscopically the tumor contains three distinct structures,—a cylindromatous type of growth, a simple tubular endothelioma, and a form in which closely packed cell areas are surrounded by septa of connective tissue which have undergone hyaline degeneration. (Plate VIII, Fig. 1.) There is a moderate amount of elastic tissue present, but no cartilage and no epithelial structures.

CASE XLVI.—College of Physicians and Surgeons, Old Series No. 1727. The tumor was removed from the parotid region of a man aged fifty-seven years. No history has been recorded except that the tumor had been present for a number of years. The material which had been preserved consists of numer-



ous fragments which together measure some six by five by four centimetres. The outer surface of the tumor is covered with nodular elevations. The whole is surrounded by a fibrous tissue capsule. Portions of the parotid gland are adherent to the periphery of the growth. The cut section is opaque and uniform in appearance except for the presence of small areas of softening and hæmorrhage. No cartilage is visible. Microscopically the growth resembles a large-celled sarcoma, but at the peripheral portions of some of the cell masses an alveolar arrangement can be worked out. The alveoli are filled with mucus which takes a blue color with hæmatoxylin. There is no connective tissue between the individual cells. Elastic tissue is not abundant. No cartilage is present. No invasion of neighboring lymph nodes. The parotid gland is not involved. It is difficult to exactly class this tumor, for which the original diagnosis was adenosarcoma. Some observers might with perfect right insist that the morphology more closely resembles the sarcomatous type than that called endothelial. The vessels are more numerous than in the purely endothelial tumors, and in certain areas the cells are in very close relation to the vascular endothelium, giving an appearance such as is found in the angiosarcomata.

CASE XLVII.—Old No. 1728. The specimen is a tumor from the parotid region. No other record has been preserved. The material consists of a few blocks of tissue evidently removed from a large mass. Microscopically the growth is largely composed of myxomatous tissue with strands of cells lying in it. These cells form alveoli containing hyaline material. Small areas of cartilage are scattered throughout, not in the form of clean cut nodules, but rather in diffuse masses with large oval cells, shading off gradually into the myxomatous areas with spindle cells. The transition is very gradual, and it is often impossible to decide just where the point of separation occurs. In portions of the growth the stroma cells are arranged in well-formed alveoli with high cylindrical cells lining the walls. No pearls are present. Elastic tissue is very abundant.

CASE XLVIII.—Old No. 1844. The patient was a female fifty years old. Three and one-half years previous to operation a swelling appeared in front and below the right ear. The tumor has grown rapidly and is now of large size. It is slightly movable on the deeper parts. The skin is red and adherent. The

tumor is oval in form and measures thirteen by nine and a half centimetres. It is rather soft and elastic to palpation. Macroscopically the cut surface of the growth is of fine texture with numerous clear areas of mucous degeneration. There are faintly marked fibrous tissue trabeculae throughout the tumor, and it is surrounded on its outer aspect by a thin capsule. Microscopically the growth is composed chiefly of soft fibrous tissue, which is the site of advanced mucous degeneration and closely packed cells of spindle and oval form resembling sarcoma. In portions of the growth where the fibrous tissue is more dense, however, the cells are arranged in alveoli and strands as in the endothelial type. No pearls are to be found. Elastic tissue is abundant. No record of a recurrence.

CASE XLIX.—Old No. 1858. The tumor was removed from the submaxillary region of a male aged forty, after a slow growth of seven years. The tumor measures seven by five by five centimetres and weighs 110 grammes. It is encapsulated. The surface is lobular. Trabeculae run into the growth from the capsule and divide it into numerous secondary lobules which are filled with soft cellular masses cutting like cheese. The color of the cellular areas is pale, and there are numerous transparent spots due to mucous degeneration. Microscopically the growth varies a good deal in different portions. Some of the areas resemble an angiosarcoma, except that the cells do not lie in close contact with the vessels, but are separated from them by a thick vascular wall. In other areas the morphology is cylindromatous, with long anastomosing strands of cells separated from each other by connective tissue altered by advanced hyaline degeneration. In certain portions there is hyaline degeneration of the connective tissue with mucous degeneration of the cells bordering the degenerated connective tissue. The cells over large areas are replaced by mucous secretion. No definite epithelial structures can be found. Elastic tissue is abundant. No cartilage is present. The further history of the case is not known.

CASE L.—The tumor was removed from the left parotid region of a male of twenty-seven years. He had had a small movable tumor in this region since childhood. Growth has been very slow and constant since that time. The tumor measures about two centimetres in diameter, is easily movable in all directions, and is very hard. About two centimetres posterior to the



**CASE I.**—Sketch from a photograph of a patient with a parotid tumor and congenital malformations of the ear and face.



tumor is a small pedunculated growth which was congenital. It is roughly one centimetre long and one-half centimetre in diameter. The form is cylindrical and the surface is covered with fine hair. The growth is attached by a pedicle to the deep fascia. The ear also shows an auricular fistula, which was noticed at the time of birth. The tumor over the parotid is lobular and encapsulated; its cut section is white and close grained, with a few small islands of cartilage scattered irregularly throughout. Microscopically the tumor is of the conventional endothelial type with islands of cartilage and much mucous degeneration. There is nothing peculiar about the growth except that there are numerous pearls in the more cellular portions. These pearls are formed of masses of flattened cells with a central area in which no structure can be made out. At the periphery of the pearls the epithelial cells show characteristic fibrillations and intracellular bridges. Keratohyalin granules can be seen in a few cells. In the neighborhood of the pearl containing tissue are also a few cysts and branching tubules lined with a single layer of flat cells which stain deeply with eosin. These cells are of the same appearance as the epithelial cells forming the periphery of the pearls, and though no fibrillæ can be made out, they resemble in morphology the other epithelial cells in the sections. Elastic tissue is abundant in the tumor.

The small pedunculated mass posterior to the tumor contains a spur of fibro-elastic cartilage, and seems most easily explained as an accessory tragus. This assumption is rendered more probable by the presence of another congenital malformation, the auricular fistula. The case is of especial interest because of the connection of a tumor containing embryonal tissues with other congenital malformations of the facial region, as evidenced by the accessory tragus and auricular fistula. No recurrence has taken place in two years.

CASE LI.—Old No. 1959. Tumor removed from side of neck. No other history concerning the specimen has been recorded. The portions of the tumor which have been preserved are two flat sections measuring some three by five centimetres and one to five centimetres thick. The external surfaces are lobular and encapsulated. The cut surface is smooth and compact and contains scattered areas of cartilage. Microscopically the growth is of the endothelial type with strands and alveoli and cartilaginous

areas merging imperceptibly into the cellular masses. There is but little mucous degeneration. Well-formed pearls are present formed of flattened cells at the outer portions, and in the centre a mass of degenerated cells which stain red with eosin. In the peripheral portions of the pearls the cells can be seen to be connected by intercellular bridges, the fibres from which pass over into the cell bodies. The pearl-forming cells are in contact with those of the solid strands and alveoli of the endothelial type and continuous with the latter. The pearls do not occupy any limited area, but are scattered throughout the more cellular portions of the growth. Elastic tissue is very abundant in all portions of the growth.

CASE LII.—College, No. 2017. The tumor was removed from the parotid region of a female aged twenty-four years. The growth had been noticed for two years previous. The tumor is a lobular, roughly spherical mass, two centimetres in diameter. It is encapsulated. Microscopically the tumor is composed of branching strands of cells lying in a matrix of connective tissue, much of which has undergone mucous degeneration. No cartilage nor evident epithelial structures are present. Elastic tissue is moderately abundant. No recurrence.

CASE LIII.—College, No. 2397. The patient was a female fifty years of age. The tumor was situated in the parotid region and had been noticed for one year. The growth is a pear-shaped, encapsulated mass, measuring seven by six by four centimetres. It is surrounded by a dense fibrous capsule. Microscopically the growth is of a mixed type, showing solid masses of cells in certain areas and alveoli in others. Some of the alveoli are lined with high cylindrical epithelium. Elastic tissue is abundant. No invasion of the lymph nodes. No cartilage present; has not recurred.

CASE LIV.—No record is preserved of this tumor. The specimen is designated as a myxochondroma of the parotid. The tumor measures three by three by five centimetres and is encapsulated. Ragged fragments of the parotid gland are attached to the periphery of the growth together with portions of the masseter muscle. One pole of the oval tumor is firm and shows a smooth homogeneous cut surface. The other pole has softened and broken down to form an irregular cyst cavity. The capsule is some three millimetres thick and composed of dense fibrous tissue.

Microscopically the growth is largely composed of mucous tissue with many spider cells. Scattered through this tissue are long anastomosing strands of cells which occasionally form alveoli. Parotid tissue is compressed by the tumor and somewhat atrophied, but the tumor structures have not invaded the salivary gland. Small islands of cartilage are scattered through the growth and occasional epithelial pearls can be seen.

CASE LV.—The original tumor was removed from a man of fifty-five years of age. It was on the left side of the neck just under the body of the inferior maxilla. The growth had been noted for about two years. It was adherent to the deeper tissues and partly encapsulated. Microscopically it was an exceedingly cellular growth with branching strands of cells, some of which form alveoli with hyaline contents. No cartilage is present and no epithelial structures; elastic tissue is abundant. Recurrence in three months with invasion of the tissues of the neck and the periosteum of the inferior maxilla. The recurrence retains to a certain extent the alveolar arrangement of the primary growth, but is more diffuse and cellular, and invades the muscle and connective tissues of the neck. No invasion of the regional lymph nodes. The patient died a few months after the second operation.

CASE LVI.—The tumor is in the collection of the Pathological Department, labelled myxosarcoma of parotid. No other record has been preserved. The growth is an oval encapsulated mass measuring about seven by five by four centimetres. In the centre is a ragged cavity formed by necrosis of the tumor cells. The tumor is divided into large alveoli by trabeculae of connective tissue. The contents of the alveoli are translucent and soft. These areas are seen to be made up of mucous tissue when examined microscopically. In this mucous tissue lie strands of cells occasionally arranged to form alveoli which contain hyaline material. No cartilage or epithelial structures are present. Elastic tissue is very abundant.

CASE LVII.—St. Luke's, No. 1792. The tumor was removed from left submaxillary region of a young woman of twenty-eight years. She had noticed the tumor for four years, and thought that the growth had been very slow until three months before the operation. It is now the size of an English walnut, and is freely movable in the lax tissues of the neck. The tumor when removed and hardened measured three by three and one-half by two centi-

metres. The surface was smooth but slightly lobular, and the tumor was inclosed in a thin capsule. Cross-section of the growth shows a firm white mass without visible trabeculae. Microscopically the tumor is composed of interlacing strands of cells with an occasional dilatation forming an alveolus which is often filled with hyaline material. No cartilage and very little degeneration are present. No epithelial structures. No recurrence in six months.

CASE LVIII.—A small tumor removed from right submaxillary region of a woman of thirty years. No history was obtained, except that no recurrence has taken place in the two years since the operation. The tumor measures four by three by two centimetres. The surface is rough and covered with fragments of the submaxillary gland and fibrous tissue. On section the surface is very pale and translucent. Some of the more cellular areas are yellow and opaque from the fatty degeneration of the cells. There are a few small cysts, none over three millimetres in diameter. No cartilage is visible. Microscopically the growth is of the ordinary endothelial type, with no peculiar characteristics except that scattered through the tumor are well-defined alveoli lined with high cylindrical epithelium which is often fatty. These alveoli bear a striking resemblance to the atrophic ducts of the submaxillary tissue which are adherent to the periphery of the tumor. At one portion of the growth near the periphery the alveoli are filled with flat epithelial cells which are arranged to form imperfect pearls. No cartilage is present in the growth, and very little mucous degeneration of the connective tissue is to be found. Fragments of this tumor were examined for glycogen both before and after hardening, but none could be demonstrated. Elastic tissue abundant. (Plate VII, Fig. 1.) Some areas of the tumor show excellently the production of the morphological appearances, which have been called cylindromatous by the softening of the connective-tissue trabeculae, many of which have undergone hyaline degeneration. (Plate VII, Fig. 2.)

CASE LIX.—The specimen has no record except that it was removed from the parotid gland. The amount of material indicates that the tumor must have been of the size of a man's fist. The larger portion of the growth is well encapsulated and endothelial in type. No cartilage is present. Other portions show a peculiar alveolar structure resembling a gelatinous carci-



PLATE I.

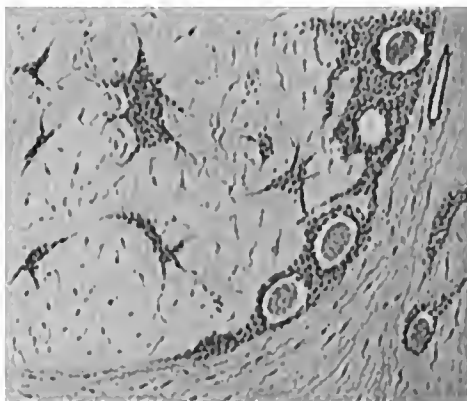


FIG. 1.—Case VI. Endothelial portion of the tumor from the cheek which contained epithelial pearls.



FIG. 2.—Case VI. Epithelial tubules, cartilage, and alveoli of the so-called endothelial type.

PLATE II.

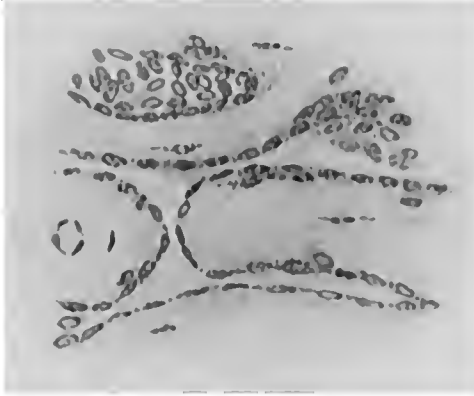


FIG. 1.—Case VI. Endothelial type of alveoli with flat cells lining the lymph spaces and spreading out into the surrounding connective tissues.

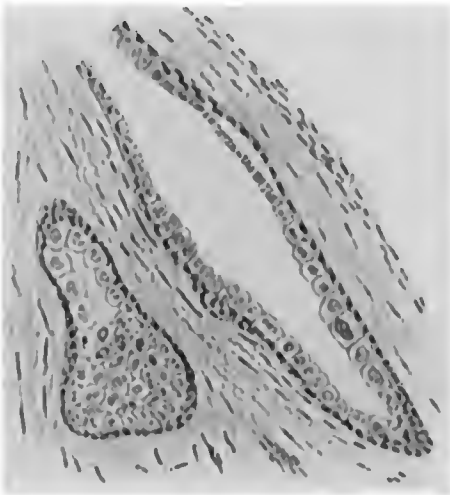


FIG. 2.—Case XX. Invasion of lymph spaces in a pharyngeal tumor by epithelial cells which leave the endothelial lining of the lymph space in its normal condition.

PLATE III.

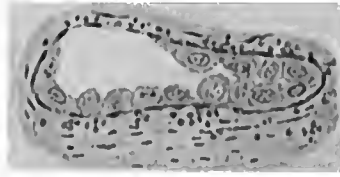


FIG. 1.—Lymph channel from the periphery of an axillary lymph node invaded by the cells from a carcinoma of the breast,

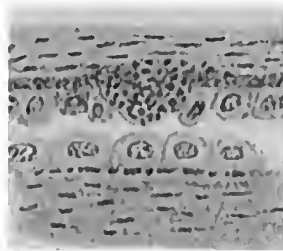


FIG. 2.—Case XX. A lymph space from tumor of the pharynx showing the proliferation of the endothelium displacing the epithelial cells of the tumor from their position on the walls of the space,

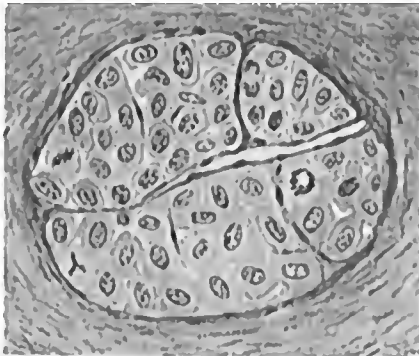


FIG. 3.—Case XIX. Section showing one of the alveoli and the close relationship of the cells to the blood-vessels.

PLATE IV.



FIG. 1.—Cases VI and XXXII. Nest of epithelial cells in embryonic gelatinous tissue.

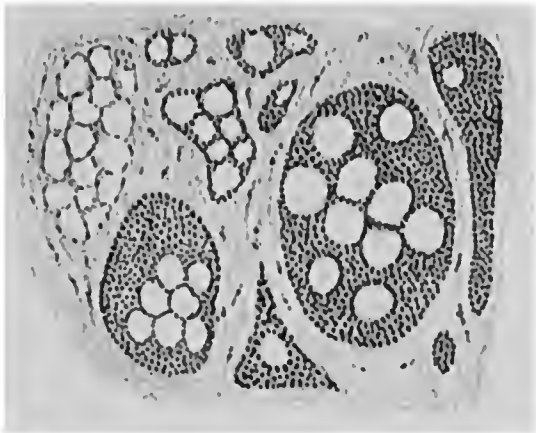


FIG. 2.—Case XVIII. Cylindromatous type of tumor from the neck.

PLATE V.

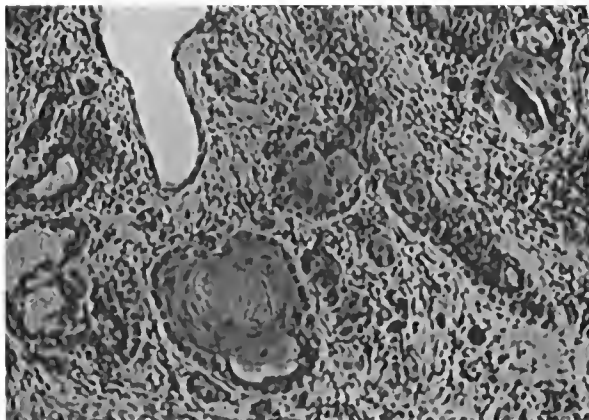


FIG. 1.—Case VI. Epithelial pearls in a tumor from the cheek near the parotid gland. Other portions of the growth are of the endothelial type.

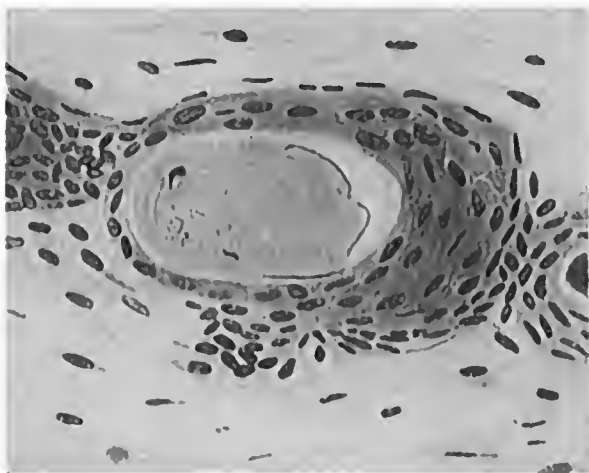


FIG. 2.—Case VI. Detail from one of the epithelial alveoli showing prickly cells and fibrillae in the epithelial cells. Kromayer's modification of Weigert's fibrin stain.

PLATE VI.

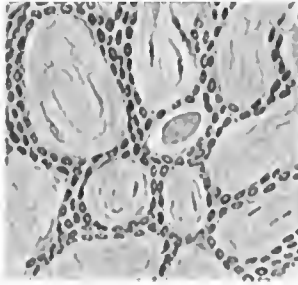


FIG. 1.—Case XXV. First recurrence showing alveolar arrangement of the cells of the tumor.

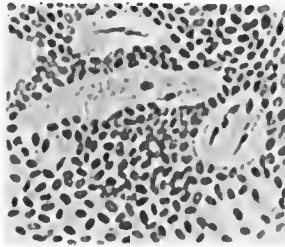


FIG. 2.—Case XXV. Second recurrence.

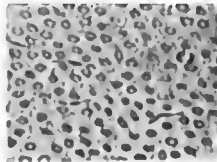


FIG. 3.—Case XXV. Third recurrence with approach to an indifferent type resembling sarcoma. Small connective-tissue spindle-cells can be seen lying between the cells of the tumor.

PLATE VII.

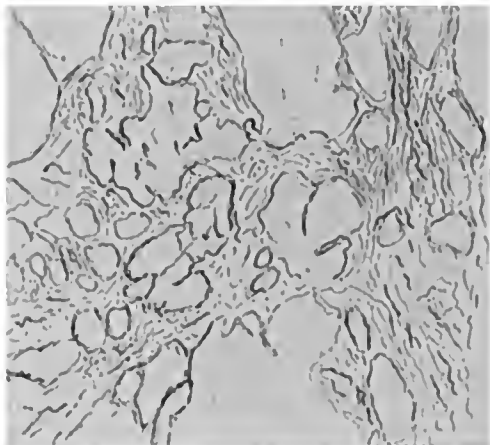


FIG. 1.—Case LVIII. Elastic tissue net-work stained by Weigert's method.

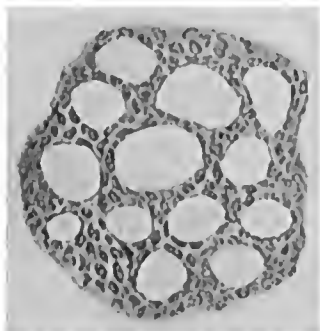


FIG. 2.—Case LVIII. Alveoli filled with colloid material.



FIG. 3.—Case XXXIV. Alveoli filled with mucus

PLATE VIII.

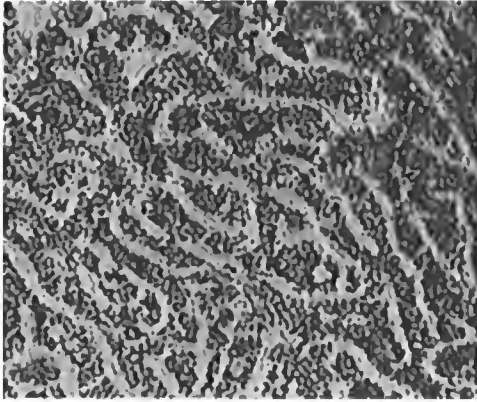


FIG. 1.—Case XI.V. In this portion of the growth the parenchyma is more abundant than the stroma, which remains as a small hyaline layer along the course of the blood-vessels.



FIG. 2.—Case LIX. Portion of tumor with a large amount of mucous degeneration in the stroma.



noma which appears to be due to a large production of mucus crowding the cells of the tumor into strands. No flat epithelial cells with spines were found in the growth, which is chiefly interesting for its peculiar morphology; the transition between the endothelial portions and those resembling carcinoma being quite gradual. (Plate VIII, Fig. 2.)

[TO BE CONTINUED.]